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doubt that the masters in modern biological thought have a ready answer to all or most of the questions which naturally arise in a thinking mind while considering the existence of scavengers among animals. Is not the subject worthy of their further attention, and may we not have the pleasure of reading their views in the *Naturalist*?

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## ON A PROVISIONAL HYPOTHESIS OF SALTATORY EVOLUTION.

BY W. H. DALL.

IT has long been brought forward, as against the Evolutionary Theory, that there were missing links in the chain of development which could not fairly be charged to the account of deficiencies in the palæontological record. This is the chief weapon of all opponents to the doctrines so generally received by modern naturalists. The number of instances in which the objection is well founded has been much exaggerated, but that there are cases of the kind will not, I think, be denied by any impartial student, though some imprudent partisans of the new faith have rather scoffed at the idea.

Having confidence that evolution when fully understood in all its modes will prove amply sufficient to account for all phases of organization, and realizing that leaps, gaps, saltations, or whatever they may be called, do occur, I have for some years made this branch of the subject a matter of reflection in the hope of arriving at some clew to the mode.

I have had my attention more especially called to the matter in studying a phase of the kind of evolution I have here termed *saltatory*, which is especially referred to in Cope's paper on the Origin of Genera, where, if I recollect rightly, it finds expression in the paradox that "the same species may belong to two different genera."<sup>1</sup> That is, more explicitly, that species which are abundantly proved to be distinct from each other by generic characteristics may be, so far as their specific characters are concerned, not distinguishable from one another. Such cases are mentioned by Cope in the paper alluded to, and there are other well-known instances of the paradox among birds, Crustacea, and Brachiopoda.

(1.) As an illustration of how the apparent leaps, which

<sup>1</sup> Not having seen Professor Cope's paper since about the time of its publication, and a copy not being accessible to me at this time, I may not have quoted the exact words, but the idea is the same.

nature occasionally exhibits, may still be perfectly in accordance with the view that all change is by minute differences gradually accumulated in response to the environment, I would offer the following example:—

In any sloping gutter of a paved street not too cleanly swept, every one will have noticed during a sudden shower how small particles of earth and other materials will sometimes act as a dam, producing a puddle which, relieved by partial drainage, may for a time appear to remain *in statu quo*. A time comes, however, when the gradually accumulated pressure suddenly sweeps the dam before it for a short distance. Then another similar pool is formed, and so on indefinitely.

(2.) The modern idea of a species may be stated to be a *greater or lesser number of similar individual organisms in which for the time being the majority of characters are in a condition of more or less stable equilibrium; and which have the power to transmit these characters to their progeny with a tendency to maintain this equilibrium.*

(3.) This tendency may be in some cases sufficiently strong to resist for a considerable period the changes which a gradual modification of the environment may tend to bring about. When the latter has reached a pitch which renders the resistance no longer effectual, it is conceivable that a sudden change may take place in the constitution of the organism, rapidly adapting it once more to its surroundings, upon which the tendency to equilibrium may reassert itself in the minor characteristics, and these may, as it were, crystallize once more in a manner not dissimilar in its results to the form which was recognizable in the earlier generic type.

(4.) If among a certain assemblage of individuals forming a species the tendency to maintain the specific equilibrium is (as it should be, *a priori*) transmitted to individual offspring in different degrees of intensity, a gradual separation may take place between those with the stronger tendency to equilibrium, and those with less.

(5.) Those yielding to the pressure of the environment (let us say in the manner indicated in paragraph 3) must by the law of natural selection become better adapted to it, and with their changed generic structure may be able to persist.

(6.) On the other hand, those with the broader base, so to speak, with an inherited tendency to remain unshaken by the modifications of the environment, may be conceived as being and

remaining, through this tendency, less injuriously affected by *adverse* circumstances and consequently might still endure.

(7.) In short, natural selection in the one case might find its fulcrum in the easy adjustment of characters; and in the other case in the inherited persistency in equilibrium, by which the organism would be rendered more or less indifferent to the injurious elements of the environment as well as to its favorable phases.

(8.) The intermediate individuals, by the hypothesis, would be those least fitted to persist in any case, and therefore would be few in number and rapidly eliminated. Then we should have a parallel series of species in two or even more genera, existing simultaneously.

(9.) The above hypothesis would account for the special class coming under the paradox quoted, and has an important bearing on the interpretation of certain embryological changes. For other forms of Saltatory Evolution attention should be directed to the inherited tendency to equilibrium which is the converse of the inherited tendency to vary, but which has hardly been granted the place in the history of evolution to which its importance entitles it. Mr. Darwin, whom nothing escapes, has apparently recognized it in his testimony to the "remarkably inflexible organization" of the goose. Other writers seem to have been chiefly attracted by the converse of this tendency, as, under the circumstances, is most natural.

It seems as if the preceding reasoning might serve as a key to many puzzling facts in nature, and perhaps deprive the catastrophists of their most serviceable weapon.

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## HINTS ON THE ORIGIN OF THE FLORA AND FAUNA OF THE FLORIDA KEYS.

BY L. F. DE POURTALES.

**D**URING several seasons passed on or near the Florida reefs and keys, engaged in sounding and dredging in the Gulf Stream, in the service of the United States Coast Survey, I had occasion to make a few observations on the vegetable and animal inhabitants of the islands. They were of course made without system, only in such places where the steamer happened to be in stormy weather, and I have been obliged to complete them as much as possible by the observations of others. Incomplete as they still are, they are given in the hope of drawing the atten-